

Patent claims

1. Illumination system for wavelengths ≤ 193 nm, especially for EUV-lithography
with

1.1 a plurality of light sources

1.2 a mirror device for generating secondary light sources comprising several mirrors, said mirrors are comprising raster elements, whereby the illumination system is characterized in that

1.3 the plurality of light sources are coupled together in order to illuminate the exit pupil of the illumination system up to a predetermined degree of filling.

2. Illumination system according to claim 1, further characterized in that the mirrors of the mirror device for generating secondary light sources comprise raster elements for shaping the field.

3. Illumination system according to claim 2, further characterized in that several mirrors with raster elements are fashioned as field raster element plates.

4. Illumination system according to one of claims 1 to 3, further characterized in that the raster elements are arranged on the field raster element plate and oriented so that the images of the raster elements superimpose in the plane of the object or reticle.

5. Illumination system according to one of claims 3 to 4, further characterized in that
the number of raster elements on each field raster element plate is equal.
6. Illumination system according to one of claims 3 to 5, further characterized in that
the field raster element plates are arranged on a pyramid.
7. Illumination system according to claim 6, further characterized in that the
number of sides of the pyramid corresponds to the number of coupled light
sources.
8. Illumination system according to claim 7, further characterized in that the
coupling element is a pyramid, which serves as a carrier for the field raster
element plates.
9. Illumination system according to one of Claims 6 to 8, further characterized
in that
the sides of the pyramid are oriented so that the images of the raster
elements of the field raster element plates are superimposed in the reticle
plane.
10. Illumination system according to one of Claims 1 to 9, further characterized
in that the illumination system comprises an additional mirror device, having
at least one mirror with raster elements.
11. Illumination system according to claim 10, further characterized in that the
additional mirror device has several mirrors with raster elements.

12. Illumination system according to one of Claims 10 to 11, further characterized in that the additional mirror device is situated at the location of the secondary light sources.
13. Illumination system according to one of Claims 10 to 12, further characterized in that the raster elements are pupil raster elements.
14. Illumination system according to claim 13, further characterized in that the pupil raster elements are arranged on a pupil raster element plate.
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15. Illumination system according to claim 14, further characterized in that the pupil raster element plates are arranged on a pyramid.
16. Illumination system according to claim 15, further characterized in that the number of sides of the pyramid corresponds to the number of coupled light sources.
17. Illumination system according to claim 16, further characterized in that the coupling element is a pyramid which serves as carrier for the pupil raster element plate.
18. Illumination system according to claim 17, further characterized in that the sides of the pyramids are oriented so that the images of the raster elements of the field raster elements plate are superimposed in the reticle plane.
19. Illumination system according to claim 10, further characterized in that the additional mirror device has precisely one mirror with raster elements.

20. Illumination system according to claim 19, further characterized in that the additional mirror device is situated at the location of the secondary light sources.

21. Illumination system according to one of Claims 19 to 20, further characterized in that the raster elements are pupil raster element and a pupil raster element is situated at the location of each secondary light source.

22. Illumination system according to claim 21, further characterized in that the individual pupil raster elements are arranged on a pyramid, with only one secondary light source on each flank of the pyramid.

23. Illumination system according to claim 22, further characterized in that the number of sides of the pyramid corresponds to the number of light sources.

24. Illumination system according to one of Claims 21 to 23, further characterized in that the pupil raster elements on the pyramid flanks have a collecting mirror surface.

25. Illumination system according to one of Claims 21 to 23, further characterized in that the pyramid surfaces are planar.

26. Illumination system according to claim 25, further characterized in that the sides of the pyramid are oriented so that the images of the raster elements of the field raster element plates are superimposed in the reticle plane.

27. Illumination system according to claim 3, further characterized in that the field raster elements are distributed and tilted on the field raster element

plate such that a segment in the diaphragm plane of the illumination system is uniformly filled with secondary light sources.

28. Illumination system according to claim 27, further characterized in that an additional mirror device comprising mirrors with raster elements is situated at the location of the secondary light sources.

29. Illumination system according to claim 28, further characterized in that the raster elements of the additional mirror device are pupil raster elements.

30. Illumination system according to claim 29, further characterized in that the pupil raster elements are planar.

31. Illumination system according to claim 29, further characterized in that the pupil raster elements comprise a surface which provides a collecting effect.

32. Illumination system according to one of Claims 27 to 31, further characterized in that the pupil raster elements are distributed and tilted such that the images of the field raster elements are superimposed in the reticle plane.

33. Illumination system according to one of Claims 1 to 32, further characterized in that optical elements are situated in the optical light path after the mirror device or the several mirror devices comprising mirrors or lenses with raster elements.

34. Illumination system according to claim 33, further characterized in that the optical elements comprise field lenses or field mirrors to shape the field.

35. EUV-projection exposure system with an illumination system according to one of claims 1 to 34 further comprising
a mask
a projection objective lens
a light-sensitive object on a carrier system.

36. EUV-projection exposure system according to claim 35, designed as a scanning system.

37. Method for production of microelectronic components with a projection exposure system according to one of claims 33 to 34.

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